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WORK PLAN ADDENDUM

WELL ABANDONMENT AND REPLACEMENT PROGRAM

RF/RMRS-97-003

Revision 0

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APPROVED


John E. Law, Manager, Water Management and Treatment Date 6/24/97

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1 0 PURPOSE

This Addendum to the Well Abandonment and Replacement Program (WARP) Work Plan identifies and describes the field activities planned for the fiscal year (FY) 1997 WARP. The Addendum serves to update and supplement the main body of the Work Plan by providing detailed information on proposed FY97 well abandonments, well installations, and Geoprobe drilling and sampling sites, including discussions of the technical approach, rationale, project organization and schedule used in developing the program. The Work Plan is the principal controlling document for WARP field activities, and should be consulted for general information on program objectives, scope, site conditions, technical and operational procedures, and quality assurance practices when implementing the work covered under this Addendum. FY97 WARP will be conducted under the direction of the Environmental Restoration Division (ER) of Rocky Mountain Remediation Services, L L C (Contractor), a subcontractor member of the Kaiser-Hill Team.

During FY97, WARP will support the Groundwater Monitoring Program (GMP) in part by eliminating almost 10 percent of the active wells listed in the RFETS master well list. Efforts began in 1992 to abandon wells with questionable or poorly documented construction (i.e., nonviable wells), specifically all pre-1986 wells and wells with a 1988 designation, the remainder of these wells will be abandoned in FY97. For the first time, viable groundwater monitoring wells will be abandoned to support the 10 Year Plan for dismantling and closing the plant. Under FY97 WARP replacement Rocky Flats Compliance Agreement (RFCA) wells will be installed, as will several new wells for characterization and for plume excursion monitoring associated with the draft Integrated Monitoring Plan (IMP). New wells will fill data gaps in the current GMP that have been identified as potential uncontrolled contaminant plume migration pathways to surface water, and will replace several impaired monitoring wells used for RFCA monitoring. WARP is also scheduled to abandon wells associated with Individual Hazardous Substance Site (IHSS) 108 (Trench T-1), IHSS 114 (Present Landfill) and IHSS 119 1 (on the 881 Hillside), install a well at IHSS 113 (Mound), assist in subsurface investigations designed to characterize the nature and extent of the PU&D yard groundwater plume, and evaluate plume pathways to surface water associated with the East Trenches (B-series ponds) and northern Industrial Area (near Building 771), in support of the RMRS/ER program.

2 0 SCOPE

The scope of work in the FY97 WARP Work Plan Addendum describes eight specific tasks

- 1 Abandonment of 46 obsolete wells associated with routine groundwater monitoring program maintenance activity,
- 2 Abandonment of 29 wells associated with closure of the Present Landfill and source removal actions planned at IHSSs 108 and 119 1,
- 3 Pre-installation Geoprobe investigations of four of the new GMP well locations associated with Task 4,
- 4 Installation of ten new wells at locations where water quality and piezometric data is needed for monitoring plume migration under the RFCA per the draft IMP (DOE, 1996),

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- 5 Installation of four replacement monitoring wells at RFCA well locations 3786, 6687, 31791 and 35691 due to downhole sampler obstructions caused by casing failure or off-plumb borings (DOE, 1996), or due to submergence of the well,
- 6 Installation of one new downgradient monitoring well to monitor the performance of remediation planned for the Mound site in FY97,
- 7 Installation of ten Geoprobe wellpoints (four around Building 779 and six near the PU&D Yard) for collection of water quality and piezometric data, and
- 8 Installation of additional Geoprobe boreholes and wellpoints in the Building 771 and Pond B-3 areas to better characterize potential contaminant pathways to surface water

These activities are described in detail in the following sections

3 0 WELL ABANDONMENTS

A total of up to 75 groundwater monitoring wells and piezometers are proposed for abandonment at Rocky Flats Environmental Technology Site (RFETS) during FY97 (Figure 3-1). Wells will be abandoned in two phases, as indicated in Table 3-1, by two RFETS subcontractors according to the procedures specified in GT 11, Plugging and Abandonment of Wells. Phase I wells are high priority abandonments planned for Contractor remediation and closure activities (Present Landfill, IHSS 119 1, and IHSS 108), and nonviable relict or obsolete wells left over from early groundwater investigations (1974 and 1988 well series). Phase II wells are of lower priority and generally are dry wells. As a general rule, Phase I wells will be abandoned first followed by Phase II wells, although some overlap may be expected as a result of scheduling and work of two subcontractor crews. Appendix 1 (Table 3-2) provides well construction information for the abandonments listed in Table 3-1.

3 1 Phase I Wells

Thirty-three of the 53 Phase I wells identified in Figure 3-1 and Table 3-1 are located in or next to the boundaries of three FY 97 environmental restoration projects. At these locations, impending excavation or cap construction threaten the physical integrity of the wells or the hydraulic integrity of the associated hydrostratigraphic zones. Permanent abandonment of these wells is required to prevent (1) the migration of contaminants along well bores to deeper portions of the hydrostratigraphic unit, (2) potential breaches in the landfill cap caused by the differential vertical settlement of well casing and landfill materials, or to (3) make way for planned excavation activities. Most of these wells consist of either 2-inch diameter polyvinyl chloride (PVC) or 4-inch diameter stainless steel well casings that range in depth from 5.7 to 63.8 feet below ground surface (bgs). One bedrock well, 0886, is completed with 5-inch diameter steel conductor casing grouted to a depth of 18.3 feet.

The remaining Phase I wells and piezometers (i.e., wells installed during 1974 and all 1988 piezometers identified in Figure 3-1 and Table 3-1) have historically been used for groundwater sampling purposes, but they have become obsolete or inactive in recent years owing to concerns about substandard design and construction, and lack of documentation. These wells are mainly located in and around the Industrial Area. Most of these wells consist of 1- to 3-inch diameter PVC well casings that were installed in shallow bedrock materials. Casing depths range from 7.1 to 58.8 feet bgs. Abandonment of these wells protects alluvial and bedrock groundwater quality by dismantling the last remnants of the pre-1986 and the 1988 groundwater monitoring networks, which comprise nonviable wells and wells constructed much less rigorously as compared with current well construction (GT 06) requirements.

3 2 Phase II Wells

The 22 Phase II wells identified in Figure 3-1 and Table 3-1 have been mainly used for CERCLA site characterization at various localities around the site. Well hydrographs and water level monitoring records indicate that these wells have been consistently dry for more than eight calendar quarters, even while site-wide water levels were abnormally high during the 1992 and 1995 spring recharge. Most of these wells are constructed of 2-inch

PVC casing, two (wells 5886 and 3587) are constructed of 4-inch stainless steel casing Casing depths range from 3 5 to 44 feet bgs

TABLE 3-1
WELL ABANDONMENT SUMMARY

Well Number	Well Type	Completion Zone	Abandonment Method	Reason
PHASE I WELLS				
5074	Well	Bedrock	In Place	Obsolete, nonviable
5174	Well	Bedrock	In Place	Obsolete nonviable
5274	Well	All/Bdrk	In Place	Obsolete nonviable
5374	Well	Bedrock	In Place	Obsolete, nonviable
5474	Well	Bedrock	In Place	Obsolete, nonviable
5574	Well	Bedrock	In Place	Obsolete nonviable
5674	Well	Bedrock	In Place	Obsolete nonviable
5774	Well	Bedrock	In Place	Obsolete nonviable
5874	Well	Bedrock	In Place	Obsolete, nonviable
5974	Well	All/Bdrk	In Place	Obsolete nonviable
6074	Well	Bedrock	In Place	Obsolete nonviable
6174	Well	Bedrock	In Place	Obsolete, nonviable
6274	Well	Bedrock	In Place	Obsolete nonviable
6374	Well	Bedrock	In Place	Obsolete nonviable
6474	Well	Bedrock	In Place	Obsolete nonviable
6574	Well	Bedrock	In Place	Obsolete nonviable
6674	Well	Bedrock	In Place	Obsolete nonviable
6774	Well	All/Bdrk	In Place	Obsolete nonviable
0786	Well	Alluvium	In Place	Landfill closure
0886	Well	Bedrock	In Place	Landfill closure
3786	Well	Alluvial	In Place	Submerged need RFCA replacement
4387	Well	Alluvium	Overdrill	IHSS 119 1 Accelerated Action
6187	Well	Alluvium	In Place/Overdrill	Landfill closure
6287	Well	Alluvium	In Place/Overdrill	Landfill closure
6487	Well	Alluvium	In Place/Overdrill	Landfill closure
6587	Well	Bedrock	In Place/Overdrill	Landfill closure
6687	Well	Alluvium	In Place/Overdrill	Obstruction need RFCA replacement
7087	Well	Bedrock	In Place/Overdrill	Landfill closure
7287	Well	Alluvium	In Place/Overdrill	Landfill closure
1288	PZ	Alluvium?	In Place	Obsolete, nonviable
1388	PZ	Alluvium?	In Place	Obsolete nonviable
B106089	Well	Alluvium	In Place/Casing Dest	Landfill closure
B206289	Well	Bedrock	In Place/Casing Dest	Landfill closure
B206489	Well	All/Bdrk	In Place/Casing Dest	Landfill closure
B206589	Well	Bedrock	In Place/Casing Dest	Landfill closure
B206789	Well	Bedrock	In Place/Casing Dest	Landfill closure
01891	Well	Bedrock	Casing Destruction	Trench T-1 remediation
12091	Well	Bedrock	Casing Destruction	Trench T-1 remediation
31791	Well	Alluvium	In Place	Obstruction, need RFCA replacement
35691	Well	Alluvium	In Place	Obstruction need RFCA replacement
37991	Well	Bedrock	In Place/Casing Dest	IHSS 119 1 Accelerated Action
38191	Well	Alluvium	Casing Destruction	IHSS 119 1 Accelerated Action
38291	Well	Alluvium	Casing Destruction	IHSS 119 1 Accelerated Action
00393	Well	Alluvium	In Place/Casing Dest	Landfill closure
00493	Well	Alluvium	In Place/Casing Dest	Landfill closure
71193	Well	Alluvium	In Place/Casing Dest	Landfill closure
71493	Well	Alluvium	In Place/Casing Dest	Landfill closure
71693	Well	Alluvium	In Place/Casing Dest	Landfill closure

TABLE 3-1
WELL ABANDONMENT SUMMARY

Well Number	Well Type	Completion Zone	Abandonment Method	Reason
71893	Well	Alluvium	In Place/Casing Dest	Landfill closure
72093	Well	Alluvium	In Place/Casing Dest	Landfill closure
72293	Well	Alluvium	In Place/Casing Dest	Landfill closure
72393	Well	Alluvium	In Place/Casing Dest	Landfill closure
72493	Well	Alluvium	In Place/Casing Dest	Landfill closure
PHASE II WELLS				
0686	Well	Alluvium	In Place	Obsolete damaged
5886	Well	Alluvium	In-Place	Perennially dry
3587	Well	Alluvium	In Place	Perennially dry
B207289	Well	Bedrock	In Place	Perennially dry
B208389	Well	Bedrock	In Place	Perennially dry
B208489	Well	Bedrock	In Place	Perennially dry
P213889	Well	Bedrock	In Place	Perennially dry
P213989	Well	Alluvium	In Place	Perennially dry
B317189	Well	Bedrock	In Place	Perennially dry
00691	Well	Alluvium	In Place	Perennially dry
00791	Well	Alluvium	In Place	Perennially dry
00991	Well	Bedrock	In Place	Perennially dry
02191	Well	Alluvium	In Place	Perennially dry
02391	Well	Alluvium	In Place	Perennially dry
02791	Well	Alluvium	In Place	Perennially dry
03891	Well	Alluvium	In Place	Perennially dry
05991	Well	Alluvium	In Place	Perennially dry
40491	Well	Alluvium	In Place	Perennially dry
40791	Well	Alluvium	In Place	Perennially dry
75892	Well	Alluvium	In Place	Perennially dry
44993	Well	Alluvium	In Place	Perennially dry
46493	Well	Alluvium	In Place	Perennially dry

4 0 WELL INSTALLATIONS

4 1 Locations and Rationale

Twenty five new wells and wellpoint installations are planned for FY97 WARP. Figure 4-1 illustrates the location of 21 of the 25 groundwater monitoring wells and well points planned under FY97 WARP. The four remaining well point locations associated with the Building 779 IM/IRA remain to be selected with input from regulatory authorities. Collectively, these well and well point installations support the GMP and three other projects, as described briefly below.

Four new wells (00197 through 00497) and four replacement wells (00597 through 00797 and 00997) support compliance with RFCA as defined by the proposed well monitoring list contained within the draft IMP (DOE, 1996). The draft IMP specifies that additional plume-extent alluvial groundwater monitoring wells will be installed for characterization of groundwater plume boundaries associated with the perimeter of the Industrial Area (IA) and PU&D yard. Four wells (00197 through 00497), identified in Figure 4-1 and Table 4-1, are needed to supplement the RFCA groundwater monitoring network in tracking contaminant plume front movement toward adjacent stream drainages. These locations include an area south of the IA on the north slope of Woman Creek, an area within the IA south of the Solar Ponds, and two areas south of the PU&D yard along North Walnut Creek. In addition, four

existing RFCA monitoring wells (6687, 31791, 35691, and 3786) will be replaced by new monitoring wells (00597, 00697, 00797, and 00997, respectively) constructed to similar specifications

Data from twelve installations [six wells (01097 through 01597) and six Geoprobe wellpoints (01697 through 02197)] will help define the pre-remediation nature and extent of the PU&D yard plume. These wells are positioned around and downgradient of the yard in areas of inadequate well coverage, particularly along suspected flow paths leading to the Present Landfill and North Walnut Creek. The type of well selected depends on the ability of the Geoprobe to reach bedrock. Wellpoint installations may replace some or all of the standard wells if subsurface conditions permit deep probing. Conversely, some proposed wellpoints may be installed with a drilling rig, if only shallow probing is possible.

One well (00897) will be installed near the IHSS 113 source removal action for monitoring the impact of remediation on local groundwater quality. Four additional Geoprobe wellpoints (02297 through 02597) will be installed around Building 779 as part of the Building 779 IM/IRA. The locations for the Building 779 well points will be specified in the IM/IRA, which has yet to address groundwater monitoring issues.

These wells will be completed in the upper hydrostratigraphic unit (UHSU), which consists of Rocky Flats Alluvium, colluvium, valley fill alluvium, and some underlying weathered bedrock. Groundwater elevations may fluctuate seasonally and the level of saturation of the UHSU also varies depending upon locality. Maps showing unsaturated areas at RFETS and adjacent well hydrographs will be consulted prior to well drilling (EG&G, 1995b). Well 00197 and wells 00397 and 00497 will be sited with the assistance of a pre-installation Geoprobe survey program, as described in Section 4.3 of the Work Plan, and shown in Figure 4-1.

4.2 Construction Specifications

Table 4-2 lists the approximate depth and screen interval for each proposed well location. Final determinations will be made in the field based on actual drilling results. Wells will be installed using conventional single casing construction methods described in Section 4.2 of the Work Plan and GT 06, Monitoring Well and Piezometer Installation. Typical well construction materials will consist of 2-inch diameter, schedule 40 or 80 PVC riser and factory cut well screen, and 6-inch diameter steel surface casing with locking cap and lock. In high traffic areas steel safety posts will be installed at each corner of the well. In traffic areas and where pavement exists at a wellsite, a pre-cut, 3-foot x 3-foot opening will be removed before drilling starts. Flush-mount surface casings may be required to avoid damage in the heavily trafficked areas around Building 779; they will be installed on a case-by-case basis. Wells intended to be screened in alluvial materials will not be constructed with well screen or filter pack extending into bedrock. Only wells designed to be screened across alluvial and bedrock materials (00897) will be constructed with such a configuration.

Wellpoints will be constructed in boreholes excavated by the Geoprobe. These installations will be constructed in accordance with GT 06, Monitoring Well and Piezometer Installation.

4.3 Sampling and Analysis

Waste characterization soil samples will be collected and analyzed in accordance with Section 4.7, Field Sampling Plan, of the Work Plan. Continuous core will be collected when drilling at all well installations. Drill cuttings samples will be logged and sampled, as necessary, for well abandonment locations. Core and drill cuttings will be screened for volatile organic compounds (VOCs) and radiation using hand-held instruments specified in the 1997 WARP Health and Safety Plan Addendum. If the core is found to be free of organic/radionuclide contamination, it will be handled as waste cuttings. If VOCs are detected at levels above background, grab samples for rad screen, VOCs, and metals

will be collected immediately to minimize offgassing of VOCs. Samples for analysis of radionuclides will be collected only if field readings of radiation from the core exceed twice background levels.

TABLE 4-1
PLUME EXTENT, RFCA REPLACEMENT, PERFORMANCE MONITORING, AND
BUILDING 779 IM/IRA WELL LOCATIONS AND RATIONALE

Well No	Location	Well Type	Siting Rationale
00197	North side of Woman Creek	Plume Extent	Monitor migration of IA plume front toward Woman Creek
00297	South of Solar Ponds	Plume Extent	Monitor migration of Solar Pond plume front toward South Walnut Creek
00397	South of PU&D Yard	Plume Extent	Monitor migration of PU&D yard plume front toward North Walnut Creek
00497	South of PU&D Yard	Plume Extent	Monitor migration of PU&D yard plume front toward North Walnut Creek
00597	Well 6687	RFCA Replacement	Replacement well for RFCA
00697	Well 31791	RFCA Replacement	Replacement well for RFCA
00797	Well 35691	RFCA Replacement	Replacement well for RFCA
00897	North of IHSS 113	Performance Monitoring	Monitor downgradient groundwater quality associated with IHSS 113 remediation
00997	Well 3786	RFCA Replacement	Replacement well for RFCA
01097	Outside western edge of PU&D yard	Plume Characterization	Monitor quality of groundwater upgradient of PU&D yard and define PU&D yard plume extent
01197	Outside southern edge of PU&D yard	Plume Characterization	Monitor quality of groundwater between PU&D yard and North Walnut Creek and define PU&D yard plume extent
01297	Outside northern edge of PU&D yard	Plume Characterization	Monitor quality of groundwater between PU&D yard and firing range and define PU&D yard plume extent
01397	Outside eastern edge of PU&D yard	Plume Characterization	Monitor quality of groundwater immediately downgradient of PU&D yard and define PU&D yard plume extent
01497	Northeast of PU&D yard	Plume Characterization	Monitor quality of groundwater between PU&D yard and Present Landfill and define PU& D yard plume extent
01597	North of PU&D yard	Plume Characterization	Monitor quality of groundwater between PU&D yard and Present Landfill and define PU& D yard plume extent
01697*	East of PU&D yard	Plume Characterization	Define PU&D yard plume extent
01797*	East of PU&D yard	Plume Characterization	Define PU&D yard plume extent
01897*	East of PU&D yard	Plume Characterization	Define PU&D yard plume extent
01997*	East of PU&D yard	Plume Characterization	Define PU&D yard plume extent
02097*	East of PU&D yard	Plume Characterization	Define PU&D yard plume extent
02197*	East of PU&D yard	Plume Characterization	Define PU&D yard plume extent
02297*	Building 779	Bldg 779 IM/IRA	Monitor any changes in groundwater quality that may result from D&D activities
02397*	Building 779	Bldg 779 IM/IRA	Monitor any changes in groundwater quality that may result from D&D activities
02497*	Building 779	Bldg 779 IM/IRA	Monitor any changes in groundwater quality that may result from D&D activities
02597*	Building 779	Bldg 779 IM/IRA	Monitor any changes in groundwater quality that may result from D&D activities

*Geoprobe wellpoint

TABLE 4-2
NEW GROUNDWATER MONITORING WELLS - FY97 WARP

Well Number	Total Depth (ft)	Screen Interval (ft)	Completion Interval	Drilling Method
00197	20	8-18	UHSU/Qal	Hollow Stem Auger
00297	16	4-14	UHSU/Qal	Hollow Stem Auger
00397	18	6-16	UHSU/Qal	Hollow Stem Auger
00497	17	5-15	UHSU/Qal	Hollow Stem Auger
00597	17	5-15	UHSU/Qal	Hollow Stem Auger
00697	11	4-9	UHSU/Qal	Hollow Stem Auger
00797	27	15-25	UHSU/Qal	Hollow Stem Auger
00897	17	5-15	UHSU/Kwbr	Hollow Stem Auger
00997	10	3-8	UHSU/Qal	Hollow Stem Auger
01097	25	13-23	UHSU/Qal	Hollow Stem Auger
01197	25	13-23	UHSU/Qal	Hollow Stem Auger
01297	25	13-23	UHSU/Qal	Hollow Stem Auger
01397	25	13-23	UHSU/Qal	Hollow Stem Auger
01497	25	13-23	UHSU/Qal	Hollow Stem Auger
01597	25	13-23	UHSU/Qal	Hollow Stem Auger
01697	25	18-23	UHSU/Qal	Geoprobe
01797	25	18-23	UHSU/Qal	Geoprobe
01897	25	18-23	UHSU/Qal	Geoprobe
01997	25	18-23	UHSU/Qal	Geoprobe
02097	25	18-23	UHSU/Qal	Geoprobe
02197	25	18-23	UHSU/Qal	Geoprobe
02297	10	3-8	UHSU/Qal	Geoprobe
02397	10	3-8	UHSU/Qal	Geoprobe
02497	10	3-8	UHSU/Qal	Geoprobe
02597	10	3-8	UHSU/Qal	Geoprobe

The remaining core will be handled as waste cuttings. Samples will be handled in accordance with the pertinent SOPs. If the radiation screen results allow shipment of corresponding VOC, metal, and (when collected) radionuclide samples, they will be shipped to the appropriate laboratory for analysis. VOC samples will be analyzed by EPA-CLP SOW (ASDSWAM, Kaiser-Hill, 1997). Metals samples will be analyzed for target analyte list (TAL) metals by EPA-CLP SOW (ASDSWAM, Kaiser-Hill, 1997). Radionuclide samples will be analyzed for gross alpha, gross beta, uranium 233/234, 235, and 238, plutonium 239/240, and americium 241.

Groundwater samples that may be obtained from temporary piezometers during the pre-installation geoprobe survey for well 00197 and wells 00397 and 00497 will be collected in accordance with Section 4.3.3 of the Work Plan, and GW 06, Groundwater Sampling. Sample analyses from these piezometers will be limited to radiation screens (for shipping determinations) and VOCs using method 54 of analytical protocol 524.2 (for locating wells associated with VOC groundwater plumes).

Groundwater in new wells will be sampled separately under the GMP in accordance with the requirements of that program and, for wellpoints 02297 through 02597, under the Industrial Area IM/IRA.

5 0 GEOPROBE INVESTIGATIONS OF PATHWAYS TO SURFACE WATER

Geoprobe investigations will be performed in two poorly understood areas that yield groundwater containing VOC concentrations in excess of RFCA Teir II action level criteria. These surveys will provide data necessary for a better evaluation of potential groundwater contaminant pathways to surface water. The evaluations are being performed by the GMP to comply with the requirements of the proposed Integrated Monitoring Program.

5 1 East Trenches Groundwater VOC Plume Evaluation

Well 23296, located along South Walnut Creek between Ponds B-2 and B-3, has produced groundwater that exceeds the Teir II action level criteria for certain VOCs. The source for this contamination is thought to be the East Trenches groundwater plume, whose source is mainly Trenches T-3 and T-4. The hillside between the known plume boundaries and the stream is largely uncharacterized, and thus the location and configuration of the groundwater flowpath is uncertain. To determine whether a flowpath extends from the East Trenches into well 23296 and surface waters of South Walnut Creek, up to 20 Geoprobe boreholes will be drilled along the road south of South Walnut Creek (see line segment in Figure 5-1). A baseline arrangement of eleven boreholes will be initially drilled at 100 foot intervals along the line to locate shallow saturated zones associated with potential groundwater pathways. Up to nine boreholes will subsequently be drilled near potential pathways identified during the baseline drilling to better define the boundaries of these pathways. The location of these additional boreholes will be chosen in the field at the discretion of the Site Geologist in consultation with the Project Manager. All boreholes will be completed as temporary wellpoints in accordance with GT 06, Monitoring Well and Piezometer Installation, and GT 02, Well Development. Groundwater will be sampled in all new and some existing wellpoints to identify the most likely contaminant pathway.

5 2 North Industrial Area Groundwater VOC Plume Evaluation

Wells P219189 and 22796, located near Building 771, have also produced groundwater containing VOCs. The source for this contamination is thought to be the Industrial Area groundwater plume, which has the potential in this area to spread northward toward North Walnut Creek. Up to approximately 15 Geoprobe boreholes will be drilled along the northern edge of the 700 Area (see line segment in Figure 5-2) to evaluate whether contaminated groundwater can migrate to surface water. A baseline arrangement of eight boreholes will be initially drilled at 100 foot intervals along the line to locate shallow saturated zones associated with potential groundwater pathways. Up to seven boreholes will subsequently be drilled near potential pathways identified during the baseline drilling to better define the boundaries of these pathways. The location of these additional boreholes will be chosen in the field at the discretion of the Site Geologist in consultation with the Project Manager. All boreholes will be completed as temporary wellpoints in accordance with GT 6, Monitoring Well and Piezometer Installation, and GT 02, Well Development. Groundwater will be sampled in all new wellpoints following development.

6 0 PROJECT ORGANIZATION AND STAFFING

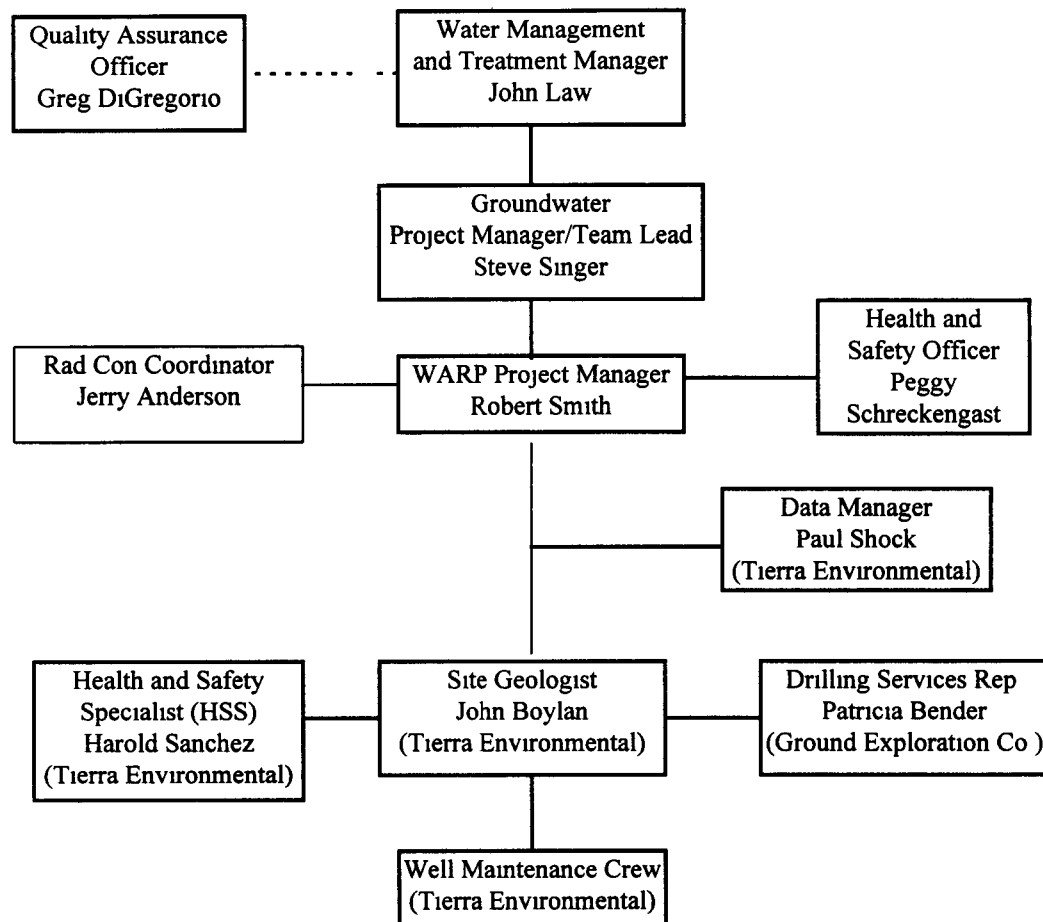
The authority and responsibility for RFETS Contractor and subcontractor personnel involved in the implementation of FY97 WARP are shown in Figure 6-1. Descriptions of key project positions contained within the chart are described in Section 3 0 of the Work Plan.

7 0 PROJECT SCHEDULE

Non-intrusive well abandonment and Geoprobe field activities for FY97 WARP are scheduled to commence on or after June 16, 1997. Intrusive well abandonment and installation activities are scheduled to begin on or after June 23, 1997, following the completion of RFETS training for the drilling subcontractor. It is expected that all field activities will be completed by August 18, 1997.

FIGURE 6-1

**ROCKY MOUNTAIN REMEDIATION SERVICES, L L C
FY97 WELL ABANDONMENT AND REPLACEMENT PROGRAM
PROJECT ORGANIZATION**



APPENDIX 1

**Table 3-2
FY97 WARP Well Abandonment Specifications**

FIGURE 3-2
FY 97 WARP WELL ABANDONMENT SPECIFICATIONS

WELL NO	WELL TYPE	STATE PLANE NORTH	STATE PLANE EAST	SURFACE ELEVATION (ft amsl)	COMPLETION ZONE	HYDRO UNIT	STRAT UNIT	CASING MATERIAL	DIA (in)	CASING DIA (in)	SEAL	ANNULAR SEAL	TOP OF FILTER PACK (ft bgl)	TOP SCRN (ft bgl)	BOT SCRN (ft bgl)	TD CSG (ft bgl)	TOP BEDROCK (ft bgl)	TD BORING (ft bgl)
Phase / Wells																		
5074	Well	751066	2084732	5956 3	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	10	130	138	80	140
5174	Well	751070	2084934	5951 5	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	10	130	138	65	140
5274	Well	751099	2085104	5952 9	AllBdrk	UHSU		PVC	2	n/a	n/a	n/a	n/a	00	70	71	85	180
5374	Well	750581	2086325	5953 1	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	30	180	180	130	180
5474	Well	751074	2086320	5933 2	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	40	180	180	90	180
5574	Well	749656	2084885	5952 3	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	40	300	340	140	345
5674	Well	750989	2086417	5955 4	Bedrock	UHSU		PVC	2	n/a	n/a	n/a	n/a	00	150	176	170	375
5774	Well	750822	2086075	5956 0	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	40	120	157	135	180
5874	Well	751568	2086930	5980 9	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	50	150	200	120	180
5974	Well	751815	2085580	5856 9	AllBdrk	UHSU		PVC	3	n/a	n/a	n/a	n/a	20	110	141	65	140
6074	Well	752106	2085775	5986 8	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	40	130	183	120	180
6174	Well	752079	2085308	5914 8	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	45	150	185	130	180
6274	Well	751738	2085154	5871 2	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	40	150	201	70	180
6374	Well	751806	2084589	5907 6	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	60	150	185	100	180
6474	Well	752234	2084694	5961 2	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	140	210	303	103	300
6574	Well	752247	2084274	5967 6	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	130	230	294	95	280
6674	Well	752089	2083792	5974 7	Bedrock	UHSU		PVC	3	n/a	n/a	n/a	n/a	10	130	178	100	285
6774	Well	750980	2080103	6048 2	AllBdrk	UHSU		PVC	3	n/a	n/a	n/a	n/a	30	570	588	577	772
0786	Well	752827	2083977	5924 9	Alluvium	UHSU		SS	2	7 25	Bentonite		25	30	57	57	50	100
0886	Well	752817	2084001	5925 6	Bedrock	LHSU		SS	2	7 25	Portland		59 0	59 1	63 8	63 8	10	71 5
3786	Well	751561	2088854	5796 6	Alluvium	UHSU		SS	2	n/a	n/a		n/a	33	86	86	76	86
4387	Well	748030	2084788	5925 1	Alluvium	UHSU		SS	2	7 5	Bentonite		30	35	123	125	120	320
6187	Well	752860	2083072	5984 4	Alluvium	UHSU		SS	2	7 5	Bentonite		30	35	282	285	280	340
6287	Well	752800	2083087	5984 5	Alluvium	UHSU		SS	2	7 5	Bentonite		50	35	266	268	263	300
6487	Well	752329	2083261	5986 1	Alluvium	UHSU		SS	2	7 5	Bentonite		120	130	233	238	220	280
6587	Well	752230	2083299	5983 5	Bedrock	UHSU		SS	2	7 5	Bentonite		100	107	240	242	210	270
6687	Well	752150	2083325	5982 3	Alluvium	UHSU		SS	2	7 5	Bentonite		50	34	180	182	153	230
7087	Well	752571	2084196	5966 7	Bedrock	UHSU		SS	2	7 5	Bentonite		30	35	163	165	120	170
7287	Well	752441	2083953	5969 6	Alluvium	UHSU		SS	2	7 5	Bentonite		30	35	68	70	80	150
1288	PZ	n/a	n/a	n/a	Alluvium?	n/a		PVC	1	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
1388	PZ	n/a	n/a	n/a	Alluvium?	n/a		PVC	1	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
B106089	Well	752310	2082580	5993 3	Alluvium	UHSU		PVC	4	7 25	Bentonite		25	37	232	245	225	275

FIGURE 3-2

FY 97 WARP WELL ABANDONMENT SPECIFICATIONS

WELL NO	WELL TYPE	STATE PLANE NORTH	STATE PLANE EAST	SURFACE ELEVATION (ft amsl)	COMPLETION ZONE	HYDRO-STRAT UNIT	CASING MATERIAL	CASING DIA (in)	BOREHOLE DIA (in)	SEAL	TOP OF FILTER PACK (ft bgl)	TOP SCRN (ft bgl)	BOT SCRN (ft bgl)	TD CSG (ft bgl)	TOP BEDROCK (ft bgl)	TD BORING (ft bgl)
B206289	Well	752253	2083564	5977.6	Bedrock	LHSU	PVC	4	7.25	Bentonite	31.0	32.4	41.8	43.1	15.0	47.5
B206489	Well	752427	2083984	5969.1	Alluvial	UHSU	PVC	4	7.25	Bentonite	2.5	3.3	10.0	11.4	7.3	41.5
B206589	Well	752458	2084121	5967.8	Bedrock	LHSU	PVC	4	7.25	Bentonite	2.3	23.5	35.1	36.2	7.6	41.5
B206789	Well	752818	2084161	5927.9	Bedrock	UHSU	PVC	4	7.25	Bentonite	8.8	9.8	19.3	20.5	4.8	30.0
00691	Well	5894.5	5896.13	5894.5	Alluvium	UHSU	PVC	2	10	Bentonite	4.8	5.3	12.3	14.3	NP	18.5
00791	Well	5907.1	5908.27	5907.1	Alluvium	UHSU	PVC	2	10	Bentonite	6.5	8.5	18.5	20.5	17.6	24.5
00991	Well	5967.0	5968.56	5967.0	Bedrock	UHSU	PVC	2	10	Bentonite	4.5	5.0	10.0	12.0	2.9	13.8
01891	Well	7494.98	2086023	5971.8	Bedrock	LHSU	PVC	2	10	Bentonite	18.0	20.0	30.0	32.0	12.4	37.0
05991	Well	7484.06	2086338	5908.3	Alluvium	UHSU	PVC	2	10	Bentonite	11.7	12.1	22.1	24.0	22.1	31.0
12091	Well	7494.96	2086009	5971.6	Bedrock	UHSU	PVC	2	11	Bentonite	13.5	14.0	22.5	24.0	13.2	24.5
31791	Well	7474.25	2084276	5877.1	Alluvium	UHSU	PVC	2	11.5	Bentonite	6.3	6.8	11.8	14.2	8.8	14.2
35691	Well	7477.97	2084005	5938.8	Alluvium	UHSU	PVC	2	11.5	Bentonite	13.4	15.6	26.6	29.0	25.2	30.3
37991	Well	7480.63	2084731	5931.5	Bedrock	UHSU	PVC	2	7.5	Bentonite	43.0	45.2	55.2	57.2	6.9	57.5
38191	Well	7480.14	2084765	5924.5	Alluvium	UHSU	PVC	2	11.5	Bentonite	8.1	10.0	15.0	17.0	14.7	18.2
38291	Well	7480.32	2084801	5924.5	Alluvium	UHSU	PVC	2	11.5	Bentonite	6.0	6.7	8.7	10.7	8.4	11.4
00393	Well	7531.73	2083768	5969.8	Alluvium	UHSU	PVC	2	12.25	Bentonite	3.5	4.0	14.0	16.0	13.2	16.8
00493	Well	7525.33	2083930	5970.0	Alluvium	UHSU	PVC	2	10	Bentonite	4.9	5.9	8.9	10.9	8.9	12.0
71193	Well	7525.66	2082717	5989.3	Alluvium	UHSU	PVC	2	7	Bentonite	8.2	10.0	20.0	22.0	20.2	36.0
71493	Well	7525.17	2082741	5989.4	Alluvium	UHSU	PVC	2	7	Bentonite	16.8	18.8	22.8	24.8	24.0	26.0
71693	Well	7522.37	2082923	5988.3	Alluvium	UHSU	PVC	2	7	Bentonite	14.0	16.3	26.3	28.3	26.3	28.3
71893	Well	7521.74	2082951	5987.7	Alluvium	UHSU	PVC	2	7	Bentonite	9.0	10.7	25.7	28.0	26.0	28.0
72093	Well	7525.50	2083206	5988.8	Alluvium	UHSU	PVC	2	3	Bentonite	29.5	44.9	49.9	51.9	49.9	52.1
72293	Well	7527.74	2083908	5973.7	Alluvium	UHSU	PVC	2	7	Bentonite	26.6	27.6	32.6	34.6	32.7	34.6
72393	Well	7525.52	2083196	5982.1	Alluvium	UHSU	PVC	2	10.25	Bentonite	10.8	26.6	36.6	38.6	NP	39.0
72493	Well	7527.70	2083903	5973.7	Alluvium	UHSU	PVC	2	7	Bentonite	17.2	17.9	27.9	29.9	NP	30.2
Phase II Wells																
0686	Well	7535.69	2086654	5814.7	Alluvium	UHSU	SS	2	7.5	Bentonite	2.8	3.3	8.9	8.9	10.5	14.0
5886	Well	7470.84	2083435	5895.2	Alluvium	UHSU	SS	2	7.25	Bentonite	1.0	1.5	3.5	3.5	3.0	10.0
3587	Well	7499.74	2087268	5950.0	Alluvium	UHSU	SS	2	7.5	Bentonite	5.0	3.5	9.4	9.6	9.1	14.4
B207289	Well	7532.67	2084360	5948.3	Bedrock	UHSU	PVC	4	7.25	Bentonite	4.2	5.2	14.7	15.9	0.2	19.5
B208389	Well	7516.87	2085584	5876.8	Bedrock	UHSU	PVC	4	7.25	Bentonite	2.9	3.4	7.8	9.1	0.2	16.3
B208489	Well	7516.83	2085636	5876.3	Bedrock	UHSU	PVC	4	7.25	Bentonite	18.8	19.8	29.2	30.5	15.5	33.2
P213889	Well	7504.65	2086109	5954.1	Bedrock	UHSU	PVC	2	7.25	Bentonite	10.3	11.3	20.8	22.0	8.0	31.9

FIGURE 3-2
FY 97 WARP WELL ABANDONMENT SPECIFICATIONS

WELL NO	WELL TYPE	STATE PLANE NORTH	STATE PLANE EAST	SURFACE ELEVATION (ft amsl)	COMPLETION ZONE	HYDRO-UNIT	STRAT UNIT	CASING MATERIAL	CASING DIA (in)	DIA (in)	SEAL	TOP OF FILTER PACK (ft bgl)	TOP SCRN (ft bgl)	BOT SCRN (ft bgl)	TD CSG (ft bgl)	TOP BEDROCK (ft bgl)	TD BORING (ft bgl)
P213989	Well	750468	2086102	5954 3	Alluvium	UHSU	UHSU	PVC	2	7 25	Bentonite	2 3	3 3	6 9	7 2	6 7	9 7
B317189	Well	748807	2083921	5725 0	Bedrock	LHSU	LHSU	PVC	2	4	Bentonite	58 1	60 6	75 1	77 3	8 5	220 4
02191	Well	749708	2086166	5965 8	Alluvium	UHSU	UHSU	PVC	2	10	Bentonite	6 0	8 0	13 0	15 0	13 5	20 8
02391	Well	749853	2086600	5956 8	Alluvium	UHSU	UHSU	PVC	2	10	Bentonite	2 5	3 0	6 0	8 0	6 9	12 9
02791	Well	749854	2087029	5954 3	Alluvium	UHSU	UHSU	PVC	2	9 5	Bentonite	6 0	6 5	9 5	11 5	8 0	15 9
03891	Well	750182	2087615	5940 9	Alluvium	UHSU	UHSU	PVC	2	9 5	Bentonite	3 4	4 0	7 0	9 0	7 4	10 6
40491	Well	750545	2083763	5677 3	Alluvium	UHSU	UHSU	PVC	2	7 5	Bentonite	6 2	8 3	10 0	12 3	10 2	12 3
40791	Well	746283	2083525	5888 5	Alluvium	UHSU	UHSU	PVC	2	7 5	Bentonite	4 3	5 3	7 0	9 3	7 0	10 0
75892	Well	750915	2086558	5956 2	Alluvium	UHSU	UHSU	PVC	2	10	Bentonite	3 9	4 3	7 3	9 3	7 6	14 6
44993	Well	751332	2085514	5926 7	Alluvium	UHSU	UHSU	PVC	2	8	Bentonite	5 5	7 5	12 5	14 5	12 5	18 0
46493	Well	751558	2085394	5903 3	Alluvium	UHSU	UHSU	PVC	2	8	Bentonite	4 0	6 0	16 0	18 0	15 6	18 0

LEGEND

n/a = not available

TBD = to be determined

NP = not penetrated

Casing Material

SS = stainless steel

PVC = polyvinyl chloride

Figure 3-1
Proposed FY97 WARP
Well Abandonments

EXPLANATION

Phase I Groundwater Monitoring Well Abandonment
Phase II Groundwater Monitoring Well Abandonment

Standard Map Features

- Buildings
- Lakes and ponds
- Streamline ditches, drainage features
- Fences
- Rocky Flats boundary
- Paved road
- Dirt road

DATE SOURCE
Revised: 06/25/97
Original: 06/25/97
Hydrology provided by
USGS (see comments)



Scale = 1:13750
1 inch represents approximately 1146 feet



State Plane Coordinate, Projected
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site



Rocky Mountain
Remediation Services, LLC
Remediation Information Systems Group
Rocky Flats Environmental Technology Site
Boulder, CO 80504-0001

MAP ID: 97-0052

April 30, 1997

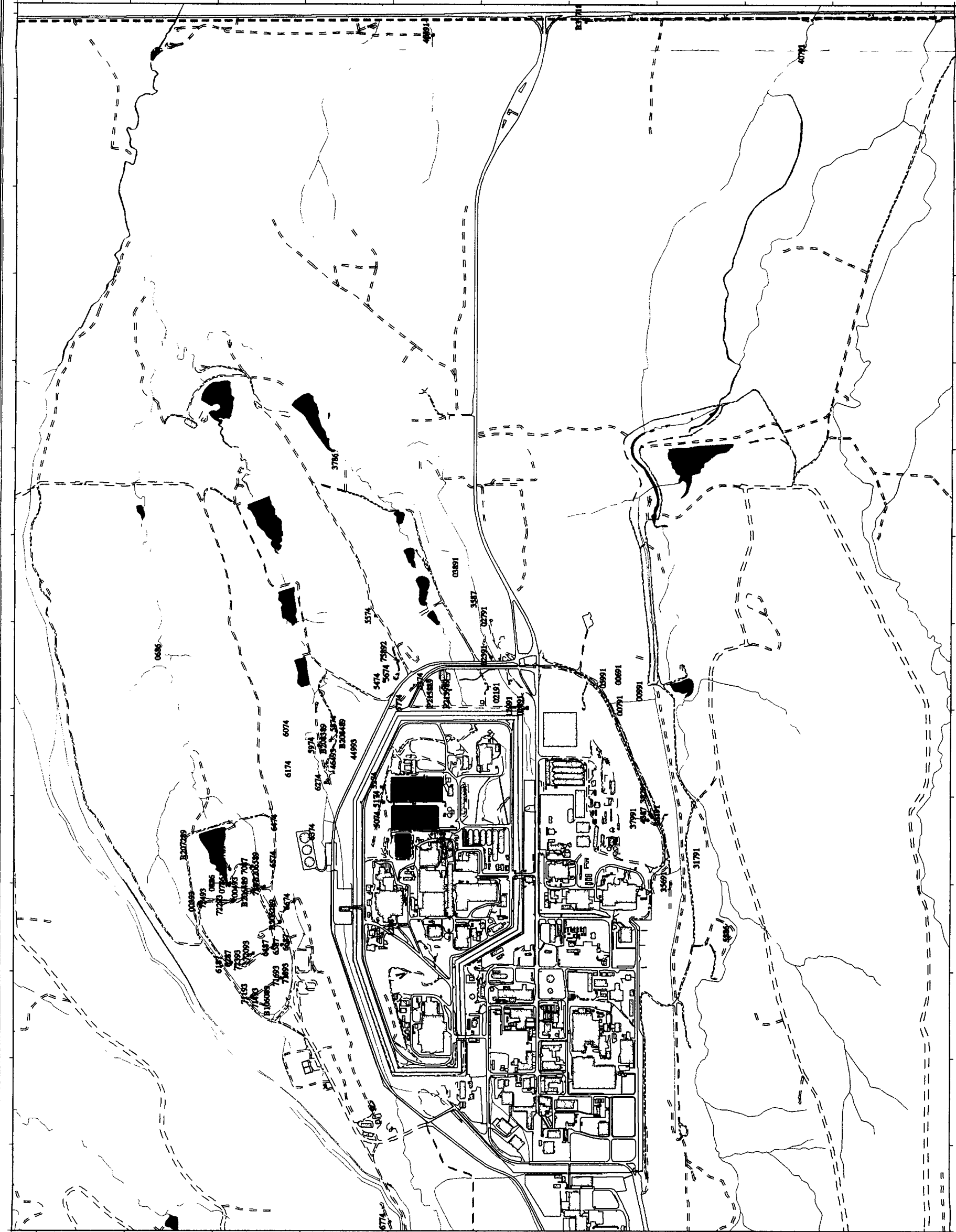
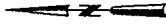


Figure 4-1
Proposed FY97 WARP
Well Installations

- EXPLANATION**
- Geoprobe well siting area
 - New RFCA Groundwater Monitoring Well
 - RFCA Replacement Groundwater Monitoring Well
 - Performance Monitoring Groundwater Monitoring Well
 - Geoprobe Well Locations
- Standard Map Features**
- Buildings
 - Lakes and ponds
 - Streams, ditches, or other drainage features
 - Fences
 - Paved roads
 - Dirt roads

DATA SOURCES:
Buildings, roads, and fences provided by
Rocky Mountain Remediation Services, LLC
Geoprobe Well Locations provided by
Rocky Mountain Remediation Services, LLC
RFCA Replacement Well Locations provided by
Rocky Mountain Remediation Services, LLC



Scale = 1" = 800 feet
1 inch represents approximately 800 feet



State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site



Rocky Mountain
Remediation Services, LLC
Geoprobe Well Locations
RFCA Replacement Well Locations
Performance Monitoring Well Locations

MAP ID: 97-0080

May 08, 1997

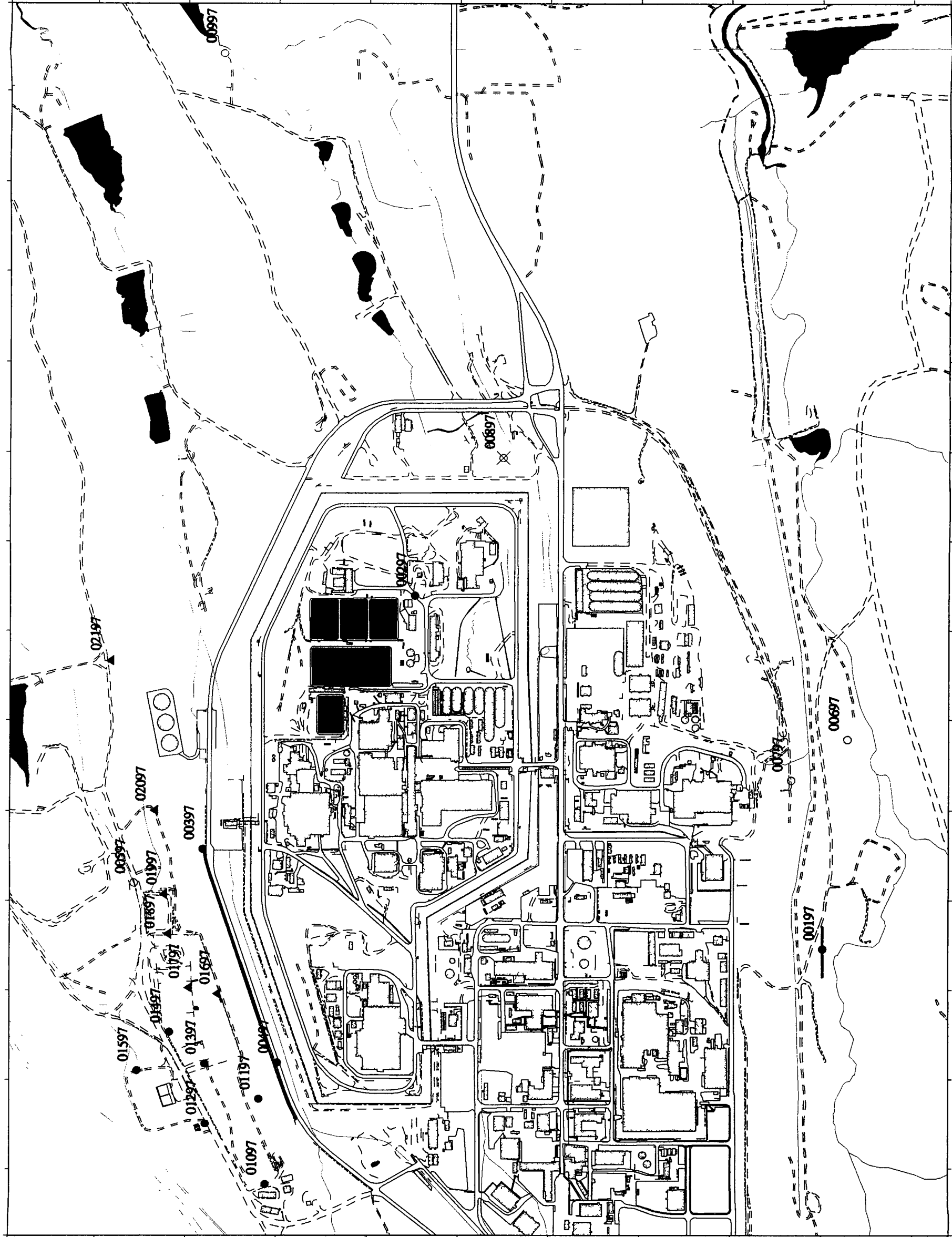


Figure 5 1
Groundwater Plume Evaluation
North of OU2 Area near
Ponds B 1, B-2, and B-3

- EXPLANATION
- Geoprobe well siting area
 - 5 Foot Contours
 - Groundwater Monitoring Wells
- Standard Map Features
- Buildings
 - Lakes and ponds
 - Streams, ditches, or other drainage features
 - Fences
 - Paved roads
 - Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by
Rocky Mountain Remediation Services, Inc. 1997.
Geoprobe well locations provided by
Rocky Mountain Remediation Services, Inc. 1997.
Topography provided by
USGS (date unknown)



Scale = 1 3380
1 inch represent approximately 282 feet



State Plane Coordinate Projection
Color d Central Zone
Datum NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

Prepared by



MAP ID 97-0080

May 09 1997

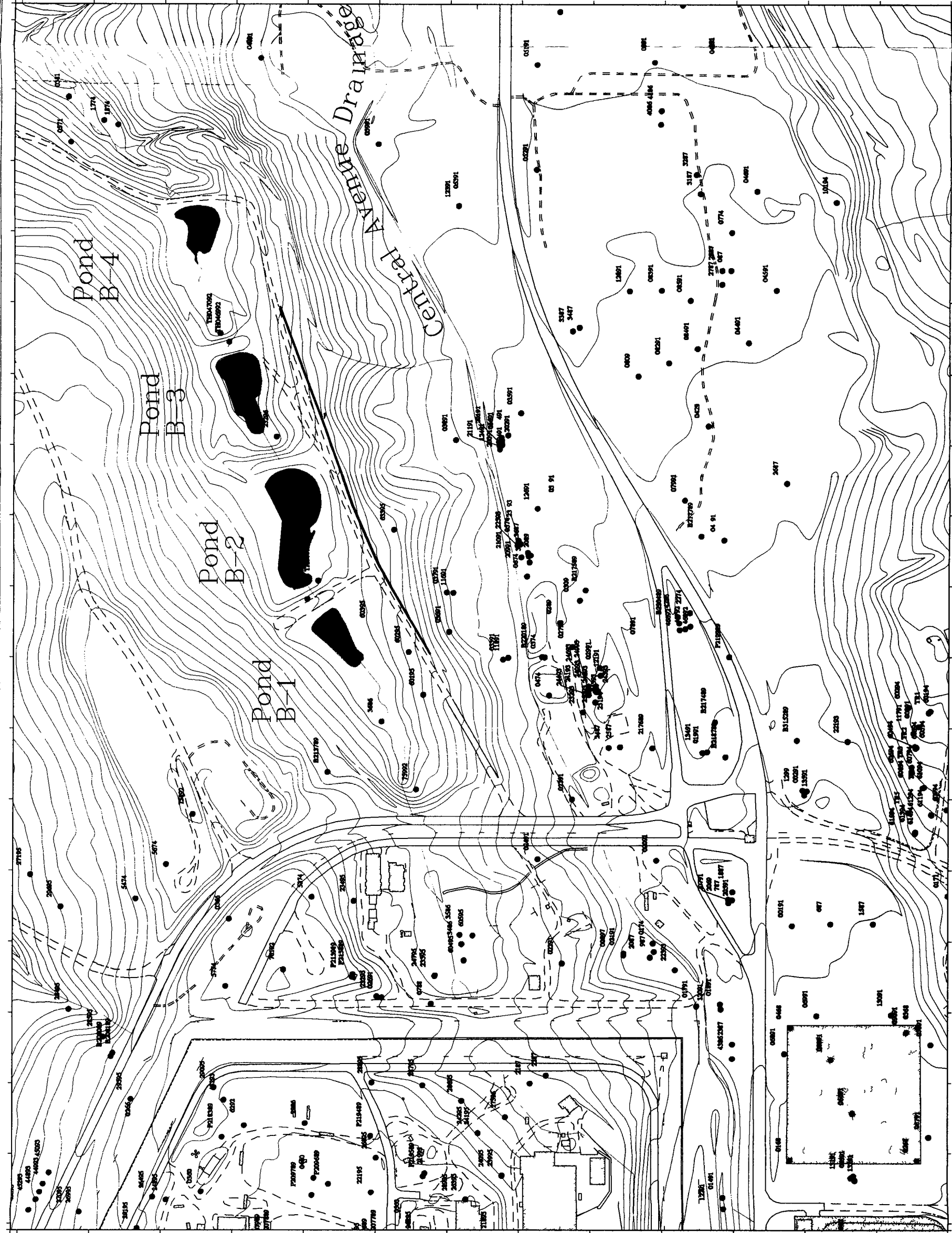
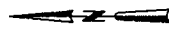


Figure 5-2
Groundwater Plume Evaluation
North of Industrial Area
near 22796 and P219189

EXPLANATION

- Geoprobe well siting area
- Groundwater Monitoring Wells
- Standard Map Features
 - Buildings
 - Lakes and ponds
 - Streams, ditches, or other drainage features
 - Fences
 - Paved roads
 - Dirt roads

DATE 06/06/02
Author: [illegible]
Reviewed by: [illegible]
Prepared by: [illegible]
Hydrology provided by: [illegible]
GIS: [illegible] (data unknown)



Scale = 1:3070
1 inch represent approximately 256 feet



Stat Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site



Rocky Mountain
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Integrative Remediation Systems Group
10000 E. 1st Ave., Suite 400
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MAP ID: 97-0080

May 03, 1997

